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Graphing Rational Functions

I Steps to graph

- ① Find any asymptotes
- ② Find any point discontinuities
- ③ make a table of values
- ④ draw pts & draw graph
(extend line!)

II Find asymptotes

[Def:] a line that the function approaches but never touches
"can't touch this"

so how do I find them?

$$f(x) = \frac{P(x)}{Q(x)}; Q(x) \neq 0$$

Vertical (x=)

- #'s that make the denominator $Q(x) = 0$

Set denom. = 0 & solve for x

Horizontal (y=)

- compare degrees top & bottom

Degree of $P(x) = m$

Degree of $Q(x) = n$

① $m < n$, then $y = 0$

② $m > n$, NONE

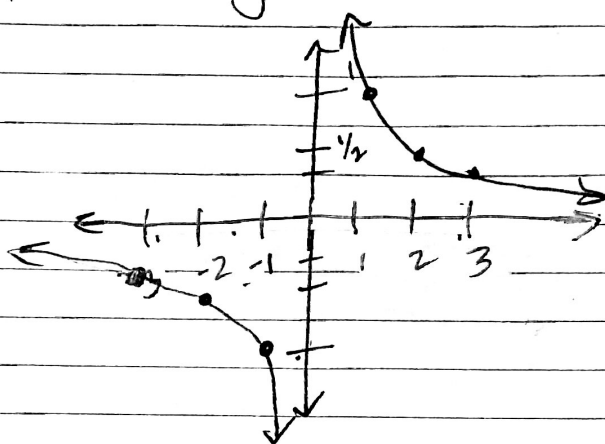
③ $m = n$, then $y = \frac{m}{n}$

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Simple rational function graphs

Parent graph $y = \frac{1}{x}$

x	y
-3	$-\frac{1}{3}$
-2	$-\frac{1}{2}$
-1	-1
0	undefined
1	1
2	$\frac{1}{2}$
3	$\frac{1}{3}$



V-asym: $x=0 \rightarrow$ domain: $\{x: \mathbb{R} \neq 0\}$
 h-asym: $y=0 \rightarrow$ Range: $\{y: \mathbb{R} \neq 0\}$

asymptote: a line that the function will never touch, but is approached.

transformations:

$$y = \frac{a}{x-h} + k$$

a = stretching (+/-)
 h = horizontal shift (L & R)

k = vertical shifts (up & down)

- vert. asym: $x=h$
 - Domain: $\{x: \mathbb{R} \neq h\}$
- horz. asym: $y=k$
 - Range: $\{y: \mathbb{R} \neq k\}$

III Find pt. discontinuity

a pt. that is defined in the original function that is not defined when function is simplified.

- IF a binomial is reduced out of the function

IV find table of values

use graphing calculator

example $f(x) = \frac{x^2 + x - 12}{x^2 - 4}$

vert. asymp.

$$x^2 - 4 = (x+2)(x-2) = 0$$

$$x+2=0 \rightarrow \boxed{x=-2}$$

$$x-2=0 \rightarrow \boxed{x=2}$$

horizontal asymp

$$m=2$$

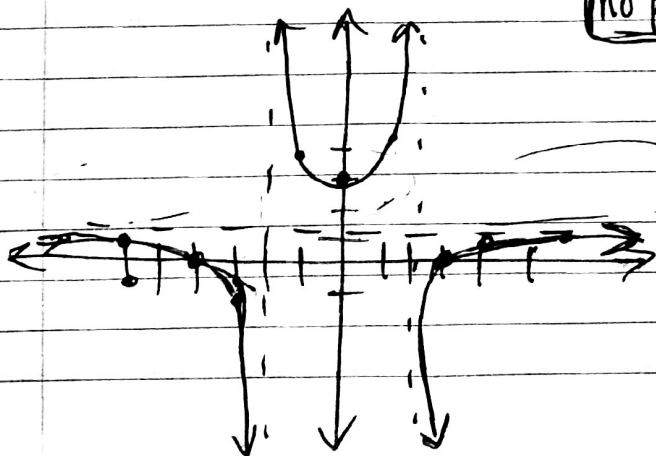
$$n=2$$

$$m=n$$

$$y = \frac{2}{2}$$

$$\boxed{y=1}$$

no pt. discant.



x	y
-6	.52
-4	0
-3	-1.2
-1	4
0	3
1	3.3
3	0
4	.66
6	.99

plus include sides of asymptotes